HYDROGEN AND WATER RECOVERING MECHANISM FOR FUEL CELL LAMINATED BODY

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Abstract

PURPOSE:To reduce required quantity of humidification for an anode, and reduce hydrogen discharged outside so as to enhance safety by providing a laminated body of a solid high polymer electrolyte type fuel cell with a function to recover hydrogen and water from anode exhaust gas to return them to an inlet side of the anode.
CONSTITUTION:A hydrogen-water recovering cell 4, gas separating plate 5, and recovering cell collecting plate 3 are arranged outside of a power generation collecting plate 1 in a laminated body to feed anode exhaust gas to the hydrogen-water recovering cell 4 and to supply current between the power generation collecting plate 1 and the recovering cell collecting plate 3. With this constitution, pure hydrogen including water content is generated and returned to an inlet side of anode gas.

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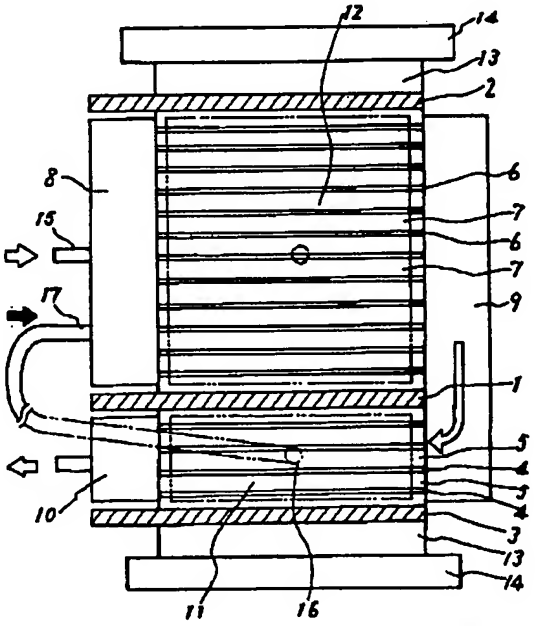
(54)【発明の名称】　燃料電池積層体の水素－水回収機構

(57)【要約】

【目的】　固体高分子電解質型燃料電池積層体にアノードの排ガスから水素と水を回収してアノード入口側へ戻す機能を持たせ、アノードの加湿必要量を低減し、外部へ排出する水素を低減し、安全性を向上させる。

【構成】　積層体内の発電集電板１の外側に水素－水回収セル４、ガス分離板５及び回収セル集電板３を配設し、アノード排ガスを水素－水回収セル４に供給し、発電集電板１と回収セル集電板３の間に電流を流すことにより、水分を含む純水素を発生させ、アノードガス入口側へ戻すようにした。



1,2:発電集電板　3:回収セル集電板　4:水素-水回収セル
5:ガス分離板　8:アノード入口側マニホールド
9:アノード出口側マニホールド　11:回収水素-水マニホールド

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【特許請求の範囲】

【請求項1】　固体高分子電解質膜を挟んでカソードとアノードを有する単セルを複数積層し、両端部に上記複数の単セルから電流を集電する発電集電板を配設した固体高分子電解質型燃料電池積層体、この燃料電池積層体の少なくとも一方の上記発電集電板の外側に回収セル集電板を設けるとともに、上記発電集電板と回収セル集電板との間に　両面に白金触媒を有する固体高分子電解質膜からなる水素－水回収セルをガス分離板を介して少なくとも1セル以上積層して配設し、上記燃料電池積層体のアノードの排気ガスを上記水素－水回収セルに導き、上記発電集電板と回収セル集電板間に電流を流して上記アノードの排気ガス中の水素と水を回収して上記アノードの入口側へ戻すようにした燃料電池積層体の水素－水回収機構。

【請求項2】　発電集電板と回収セル集電板との間に固体高分子電解質膜を挟んでカソードとアノードを有する単セルを1セル以上有する補助燃料電池を配設し、上記発電集電板と回収セル集電板間を電気的に短絡し、上記補助燃料電池で発電した電力により水素－水回収セルを駆動し、アノードの排気ガス中の水素と水を回収して上記アノードの入口側へ戻すようにした請求項1記載の燃料電池積層体の水素－水回収機構。

【請求項3】　燃料電池積層体のアノードの排気ガスを水素－水回収セルに供給し、上記水素－水回収セルで回収した水素と水を上記アノードの入口側へ供給する流路が、発電集電板、上記水素－水回収セル及びガス分離板を貫通する穴によって構成されている請求項1または2記載の燃料電池積層体の水素－水回収機構。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は固体高分子電解質型燃料電池積層体の水素－水回収機構に関し、詳しくはアノード排ガスの水素と水を回収するための積層体の構成及び機構に関するものである。

【0002】

【従来の技術】従来、固体高分子電解質型燃料電池積層体の水分を回収する方法としては、特開平2－86071号公報に開示された方法があった。それは酸素ガスの圧力によりカソード側に発生した水を多孔性部材に吸収させた後燃料電池外に排出するもので、カソード側の水分を回収するには有効であったが、アノード排ガスの水分の回収については考慮されていなかった。

【0003】一方、プロトンとともに数分子の水がアノード側からカソード側へ移動するために、例えば特開平1－40562号公報に開示された方法などを用いて、常にアノード側を加湿する必要があった。さて、ここでアノードガスとして純水素を用いる場合には、アノードガスをすべて再循環させることによりアノード側の水分を再利用することができる。ところが、メタノールなど

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の改質ガスを用いる場合には、アノード排気ガスとして、多くの水分と低濃度の水素をそのまま外部へ排出することになり、それだけアノード側の加湿必要量が増すという欠点があった。また、排出する水素の量を少なくするために燃料の利用率を上げると、水素分圧の低下により特性が下がって発電量が少なくなったり、アノードが腐食するなどの危険性があり、燃料の利用率を90％以上にまで高めることはできなかった。従って、ある程度の水素は外部に排出せざるを得なかった。ところが、固体高分子電解質型燃料電池の主な用途であるメタノール改質型電気自動車においては、例えばガレージや駐車場で水素を外部へ排気することは危険であった。

【0004】

【発明が解決しようとする課題】従来の固体高分子電解質型燃料電池は以上述べたように、メタノールなどの改質ガスを用いる場合、アノード側の加湿必要量が増すとともに、燃料の利用率に限界があり、水素を排出せざるを得ず、電気自動車の場合など安全性に問題があった。

【0005】この発明は上記のような問題点を解消するためになされたもので、アノードの排気ガスから水素と水を回収してアノード入口側へ戻し、アノードガスとして再利用することにより、燃料を効率よく利用でき、アノード側の加湿必要量を減らせ、また外部へ排出する水素量を少なくして排気の危険性を減らし安全性を向上できる固体高分子電解質型燃料電池積層体の水素－水回収機構を提供することを目的とする。

【0006】

【課題を解決するための手段】この発明の燃料電池積層体の水素－水回収機構は、固体高分子電解質型燃料電池積層体の発電集電板の外側に、水素－水回収セル、ガス分離板及び回収セル集電板を配設し、アノード排ガスを上記水素－水回収セルに供給し、上記発電集電板と回収セル集電板の間に電流を流すことにより、水分を含む純水素を発生させ、これをアノード入口側へ戻すようにしたものである。

【0007】発電集電板と回収セル集電板間を電気的に短絡し、上記両集電板間に補助燃料電池を配設し、この補助燃料電池で発電した電力により水素－水回収セルを駆動し、アノードの排気ガス中の水素と水を回収するようにしたものである。

【0008】そして、アノード排気ガスの水素－水回収セルへの供給、及び上記水素－水回収セルで回収した水素と水の上記アノードの入口側への供給流路は、発電集電板、上記水素－水回収セル及びガス分離板を貫通する穴によって構成されている。

【0009】

【作用】この発明における水素－水回収セルは電流を流すことによりアノード排ガスから水素と水を回収して水分を含む純水素を発生する。そしてこれをアノードガスとして再利用するので、アノード側の加湿必要量が減

り、また、外部へ排出する水素量が少なくなる。

【0010】また、補助燃料電池を設けており、この自己発電により水素－水回収セルの電力をまかなうので、外部電流が不要となる。

【0011】さらに、アノード排気ガス及び回収した水素と水の供給流路を発電集電板、上記水素－水回収セル及びガス分離板を貫通する穴によって構成しているので、外部マニホールドが不要となり、構成を著しく簡単にできる。

【0012】

【実施例】

実施例1．以下、この発明の一実施例を図について説明する。図1はこの発明の一実施例の固体高分子電解質型燃料電池積層体の水素－水回収機構の構成を示す模式正面図である。図において、1は一方の発電集電板、2は他方の発電集電板、3は回収セル集電板、4は両面に白金触媒を有する固体高分子電解質膜からなる水素－水回収セルで、一方の発電集電板1と回収セル集電板3の間に回収セルのガス分離板5を介して複数積層して配設される。6は固体高分子電解質膜を挟んでカソードとアノードを有する単セルで、この単セル6と燃料電池のガス分離板7を順に積層し、両端部に発電集電板1，2を配設して燃料電池積層体を構成している。8はアノードガス入口側マニホールド、9はアノードガス出口側マニホールド、10は排気ガスマニホールド、11は回収水素－水マニホールド、12はカソードガス出口側マニホールド、13は絶縁板、14は押さえ板、15はアノードガス入口、16は水素－水回収ガス出口、17は水素－水回収ガス入口である。

【0013】カソードガス入口側マニホールドがカソードガス出口側マニホールド12の裏側に取り付けられており、発電集電板1，2間の単セル6に対して、アノードガスとカソードガスが直交するように外部マニホールド8，9，12を用いて供給されている。

【0014】次に動作について説明する。固体高分子電解質型燃料電池積層体の発電原理については特開平2－86071号公報や特開平1－140562号公報に詳細に記述されているので、ここでは言及しない。固体高分子電解質膜としてはDupont社のナフィオン117やナフィオン115、Dow社の膜などが用いられる。単セル6にはガス分離板7を用いてアノードガスとカソードガスが供給される。アノードガスとしてはメタノールの改質ガス、カソードガスとしては空気が一般的に用いられ、アノードガスは何らかの手段により加湿される。アノードガスの排ガスはアノード出口側マニホールド9を通って回収セルのガス分離板5から水素－水回収セル4に供給され、発電集電板1と回収セル集電板3の間に外部電流を流すことによって水分を含む純水素（CO_2を含まないガス）を発生し、このガスは回収水素－水マニホールド11で集められ、水素－水回収ガス出口16、水素－水回収ガス入口17を通ってアノードガス入口側マニホールド8に供給され、アノードガスとして再利用される。水素と水が回収され、殆ど炭酸ガスのみとなった水素－水回収セル4の出口ガスは排気ガスとして排気ガスマニホールド10から外部へ排出される。

【0015】図2は水素－水回収セル4の作用を説明する模式説明図である。図において18は固体高分子電解質膜で、厚さは 0.2㎜以下である。19と20は白金触媒層であり、アノードの排ガス1中の水素は白金上でプロトンに置き換わり電解質膜18を通って対極に達し、ここで再び水素に変換される。白金上での水素の酸化還元反応は殆ど過電圧を要さないので極めて効率よく図2の反応を起こさせることができる。プロトン1個に対して数分子の水が一緒に移動することが知られており、プロトンとともにその数倍の水分子を回収することができる。従って、回収されたガス24は水分（水蒸気または液体）を含んだ純水素となり、炭酸ガスを含まず、アノードガスとしては最も適した組成となっている。一方、回収セルの排ガス22は大部分が炭酸ガスとなる。なお、回収する水素及び水の量は外部電流の電圧によりコントロールすることができる。

【0016】この発明では、水素－水回収セル4に電流を流すことによりアノード排ガスから水素と水を回収して水分を含む純水素を発生させ、これをアノードガスとして再利用しており、アノード側の加湿必要量が減り、燃料を効率よく利用できる。また、外部へ排出する水素量が少なくなり、排気の危険性が減り安全性が向上する。

【0017】実施例2．この発明の他の実施例においては、図1に示す発電集電板1と回収セル集電板3との間を短絡するとともに、両集電板1，3間に補助燃料電池を挿入している。そして水素－水回収セル4への電力の供給はこの補助燃料電池によってまかなわれる。水素－水回収セル1セルあたりに必要な電圧は0.1～0.2V程度なので、水素－水回収セル数セルに対して1セルの補助燃料電池で充分に電力がまかなわれる。なお、この場合、外部マニホールド8，9，12は発電集電板1及び補助燃料電池を含む形に配置される。補助燃料電池は単セル6と同一の仕様であってもよい。

【0018】実施例3．また、この発明のさらに他の実施例においては、アノード排気ガスの水素－水回収セルへの供給及び水素－水回収セルからアノード入り口側への配管は発電集電板1、水素－水回収セル4及びガス分離板5を貫通する穴によって構成している。従って外部マニホールドが不要となり、構造が簡素化される。セルやガス分離板を貫通する穴を用いて反応ガスを供給する方法は、例えば特開平2－86071号公報に詳細に記述されており、容易に構成することができる。

【0019】なお、固体高分子電解質型燃料電池におい

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ては、このような穴を用いて反応ガスなどの配管を行うことがむしろ一般的である。この実施例においては、単セル6のガス分離板7のアノードガス出口側の穴を集電板1、水素－水回収セル4及びガス分離板5を貫通させて各々の水素－水回収セルの触媒層19に供給し、水素－水回収セルの他方の触媒層20から発生した水分を含む純水素を別の穴で集電板1、水素－水回収セル4及びガス分離板5を貫通させてアノードガス入り口側の穴につなげることにより、容易に図1の外部マニホールドによる配管と同様の機能を構成することができる。ただし、セル面積が大きい場合には外部マニホールドを用いた方が構造が簡単な場合も考えられる。

【0020】

【発明の効果】以上のように、この発明の燃料電池積層体の水素－水回収機構によれば、固体高分子電解質型燃料電池積層体の少なくとも一方の発電集電板の外側に回収セル集電板を設けるとともに、上記発電集電板と回収セル集電板との間に　両面に白金触媒を有する固体高分子電解質膜からなる水素－水回収セルをガス分離板を介して少なくとも1セル以上積層して配設し、アノードの排気ガスを上記水素－水回収セルに導き、上記発電集電板と回収セル集電板間に電流を流して上記アノードの排気ガス中の水素と水を回収して上記アノードの入口側へ戻すようにしたので、燃料を効率よく利用でき、アノードガスの加湿必要量を低減でき、また排気ガス中の水素量を低減でき、安全性が向上する。

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【0021】また、補助燃料電池を挿入することによって、外部電流によらず自己発電で水素－水回収セルの電力をまかない水素と水の回収を行うことができる。

【0022】さらに、アノードの排気ガスを水素－水回収セルに供給し、上記水素－水回収セルで回収した水素と水を上記アノードの入口側へ供給する流路を、発電集電板、上記水素－水回収セル及びガス分離板を貫通する穴によって構成しているので、外部マニホールドが不要になり、構造が簡素化できる。

【図面の簡単な説明】

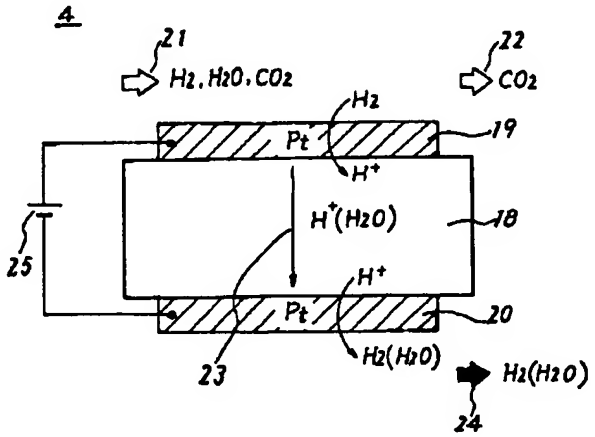
【図1】この発明の一実施例の燃料電池積層体の水素－水回収機構を示す模式正面図である。

【図2】この発明に係わる水素－水回収セルの作用を説明する模式説明図である。

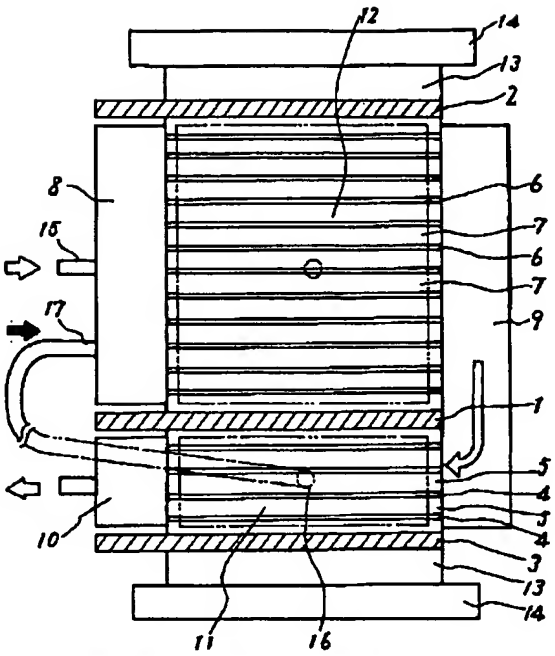
【符号の説明】

1　発電集電板
2　発電集電板
3　回収セル集電板
4　水素－水回収セル
5　ガス分離板
6　単セル
8　アノード入口側マニホールド
9　アノード出口側マニホールド
10　排気ガスマニホールド
11　回収水素－水マニホールド
12　カソード出口側マニホールド

【図2】



【図1】



1,2：発電集電板　3：回収セル集電板　4：水素-水回収セル
5：ガス分離板　8：アノード入口側マニホールド
9：アノード出口側マニホールド　11：回収水素-水マニホールド

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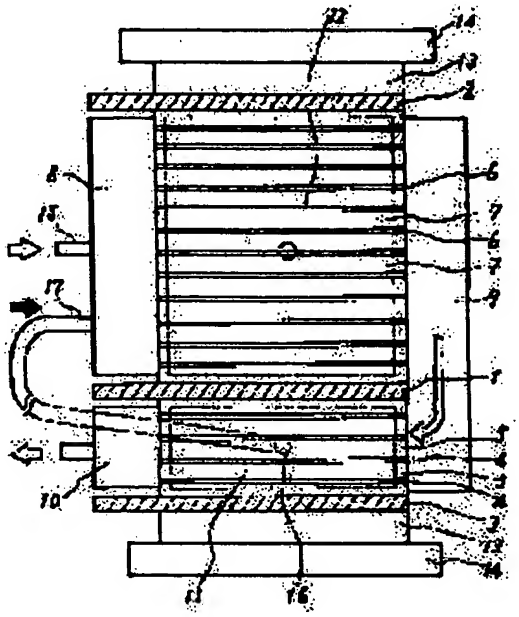
(54) HYDROGEN AND WATER RECOVERING MECHANISM FOR FUEL CELL LAMINATED BODY

(57)Abstract:
PURPOSE: To reduce required quantity of humidification for an anode, and reduce hydrogen discharged outside so as to enhance safety by providing a laminated body of a solid high polymer electrolyte type fuel cell with a function to recover hydrogen and water from anode exhaust gas to return them to an inlet side of the anode.
CONSTITUTION: A hydrogen-water recovering cell 4, gas separating plate 5, and recovering cell collecting plate 3 are arranged outside of a power generation collecting plate 1 in a laminated body to feed anode exhaust gas to the hydrogen-water recovering cell 4 and to supply current between the power generation collecting plate 1 and the recovering cell collecting plate 3. With this constitution, pure hydrogen including water content is generated and returned to an inlet side of anode gas.



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[Date of extinction of right]	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Two or more laminatings of the single cel which has a cathode and an anode on both sides of the solid-state polyelectrolyte film are carried out. While forming a recovery cel collecting electrode plate in the outside of the solid-state polyelectrolyte mold fuel cell layered product which arranged in both ends the generation-of-electrical-energy collecting electrode plate which collects a current from two or more above-mentioned single cels, and one [at least] above-mentioned generation-of-electrical-energy collecting electrode plate of this fuel cell layered product Between the above-mentioned generation-of-electrical-energy collecting electrode plate and recovery cel collecting electrode plates Through a gas division plate, carry out the at least one or more cel laminating of the hydrogen-water recovery cel which consists of solid-state polyelectrolyte film which has a platinum catalyst to both sides, and it is arranged in them. The hydrogen-water recovery device of the fuel cell layered product which led the exhaust gas of the anode of the above-mentioned fuel cell layered product to the above-mentioned hydrogen-water recovery cel, passes a current, collects the hydrogen and water in the exhaust gas of the above-mentioned anode, and was returned to the entrance side of the above-mentioned anode between the above-mentioned generation-of-electrical-energy collecting electrode plate and the recovery cel collecting electrode plate.
[Claim 2] The auxiliary fuel cell which has one or more cels of single cels which have a cathode and an anode on both sides of the solid-state polyelectrolyte film is arranged between a generation-of-electrical-energy collecting electrode plate and a recovery cel collecting electrode plate. The hydrogen-water recovery device of the fuel cell layered product according to claim 1 which short-circuits electrically between the above-mentioned generation-of-electrical-energy collecting electrode plate and a recovery cel collecting electrode plate, drives a hydrogen-water recovery cel with the power generated with the above-mentioned auxiliary fuel cell, collects the hydrogen and water in the exhaust gas of an anode, and was returned to the entrance side of the above-mentioned anode.
[Claim 3] The hydrogen-water recovery device of the fuel cell layered product according to claim 1 or 2 constituted by the hole where the passage which supplies the exhaust gas of the anode of a fuel cell layered product to a hydrogen-water recovery cel, and supplies the hydrogen collected in the above-mentioned hydrogen-water recovery cel and water to the entrance side of the above-mentioned anode penetrates a generation-of-electrical-energy collecting electrode plate, the above-mentioned hydrogen-water recovery cel, and a gas division plate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the configuration and device of a layered product for collecting the hydrogen and water of anode exhaust in detail about the hydrogen-water recovery device of a solid-state polyelectrolyte mold fuel cell layered product.
[0002]
[Description of the Prior Art] Conventionally, there was an approach indicated by JP,2-86071,A as an approach of collecting the moisture of a solid-state polyelectrolyte mold fuel cell layered product. It is discharged out of the back fuel cell which made the porous member absorb the water generated in the cathode side with the pressure of oxygen gas, and although it was effective in collecting the moisture by the side of a cathode, it was not taken into consideration about recovery of the moisture of anode exhaust.
[0003] On the other hand, in order that a child's water might move to a cathode side from an anode side several minutes with a proton, the anode side always needed to be humidified using the approach indicated by JP,1-40562,A. Now, when using pure hydrogen as anode gas here, the moisture by the side of an anode can be reused by carrying out recycling of all the anode gas. However, when reformed gas, such as a methanol, was used, many moisture and low-concentration hydrogen will be discharged to the exterior as it is as anode exhaust gas, and there was a fault that the humidification initial complement by the side of an anode increased so much. Moreover, in order to lessen the amount of the hydrogen to discharge, when the utilization factor of a fuel was gathered, a property falls by the fall of a hydrogen partial pressure, the amount of generations of electrical energy decreases, or there is danger of an anode corroding, and the utilization factor of a fuel was not able to be raised to 90% or more. Therefore, a certain amount of hydrogen had to be discharged outside. However, in the methanol-reforming mold electric vehicle which are the main applications of a solid-state polyelectrolyte mold fuel cell, it was dangerous to exhaust hydrogen to the exterior in a garage or a parking lot, for example.
[0004]
[Problem(s) to be Solved by the Invention] while the humidification initial complement of the conventional solid-state polyelectrolyte mold fuel cell by the side of an anode increases when using reformed gas, such as a methanol, as stated above -- the utilization factor of a fuel -- a limitation -- it is -- hydrogen -- not discharging -- it did not obtain but the problem was in safeties, such as a case of an electric vehicle.
[0005] the amount of hydrogen which can use a fuel efficiently , and can reduce the humidification initial complement by the side of an anode , and discharge to the exterior by having make this invention in order to cancel the above troubles , collect hydrogen and water from the exhaust gas of an anode , return it to an anode entrance side , and reuse as anode gas lessen , and it aim at offer the hydrogen-water recovery device of the solid-state polyelectrolyte mold fuel cell layered product which reduce the danger of exhaust air and can improve safety .
[0006]
[Means for Solving the Problem] By arranging a hydrogen-water recovery cel, a gas division plate, and a recovery cel collecting electrode plate in the outside of the generation-of-electrical-energy collecting electrode plate of a solid-state polyelectrolyte mold fuel cell layered product, supplying anode exhaust to the above-mentioned hydrogen-water recovery cel, and passing a current between the above-mentioned generation-of-electrical-energy collecting electrode plate and a recovery cel collecting electrode plate, the hydrogen-water recovery device of the fuel cell layered product of this invention generates the pure hydrogen containing moisture, and returns this to an anode entrance side.
[0007] Between a generation-of-electrical-energy collecting electrode plate and a recovery cel collecting electrode plate is short-circuited electrically, an auxiliary fuel cell is arranged among both the above-mentioned collecting electrode plates, a hydrogen-water recovery cel is driven with the power generated with this auxiliary fuel cell, and the hydrogen and water in the exhaust gas of an anode are collected.
[0008] And the feeder current way to the entrance side of supply in the hydrogen-water recovery cel of anode exhaust gas and the above-mentioned anode of the hydrogen and water which were collected in the above-mentioned hydrogen-water recovery cel is constituted by the hole which penetrates a generation-of-electrical-energy collecting electrode plate, the above-mentioned hydrogen-water recovery cel, and a gas division plate.
[0009]
[Function] The hydrogen-water recovery cel in this invention generates the pure hydrogen which collects hydrogen and water

from anode exhaust and contains moisture by passing a current. And since this is reused as anode gas, the amount of hydrogen which the humidification initial complement by the side of an anode becomes less, and is discharged to the exterior decreases.

[0010] Moreover, since the auxiliary fuel cell is formed and the power of a hydrogen-water recovery cel is provided by this self generating, an external current becomes unnecessary.
[0011] Furthermore, since the hole which penetrates a generation-of-electrical-energy collecting electrode plate, the above-mentioned hydrogen-water recovery cel, and a gas division plate constitutes anode exhaust gas and the collected feeder current way of hydrogen and water, an external manifold becomes unnecessary and a configuration can be simplified remarkable.
[0012]
[Example]
One example of this invention is explained about drawing below example 1. Drawing 1 is the ** type front view showing the configuration of the hydrogen-water recovery device of the solid-state polyelectrolyte mold fuel cell layered product of one example of this invention. In drawing, 1 is the hydrogen-water recovery cel which consists of solid-state polyelectrolyte film with which the generation-of-electrical-energy collecting electrode plate of another side and 3 have a recovery cel collecting electrode plate to both sides, and 4 has a platinum catalyst, carries out two or more laminatings of one generation-of-electrical-energy collecting electrode plate and 2 through the gas division plate 5 of a recovery cel between one generation-of-electrical-energy collecting electrode plate 1 and the recovery cel collecting electrode plate 3, and it is arranged. 6 is the single cel which has a cathode and an anode on both sides of the solid-state polyelectrolyte film, it carries out the laminating of the gas division plate 7 of this single cel 6 and a fuel cell to order, arranges the generation-of-electrical-energy collecting electrode plates 1 and 2 in both ends, and constitutes the fuel cell layered product. 8 -- an anode gas entrance-side manifold and 9 -- an anode gas outlet side manifold and 10 -- an exhaust air gas manifold and 11 -- for an electric insulating plate and 14, as for an anode gas inlet port and 16, a presser-foot plate and 15 are [a recovery hydrogen-water manifold and 12 / a cathode gas outlet side manifold and 13 / a hydrogen-water recovery gas outlet and 17] hydrogen-water recovery gas inlets.
[0013] The cathode gas inlet side manifold is attached in the background of the cathode gas outlet side manifold 12, and to the generation-of-electrical-energy collecting electrode plate 1 and the single cel 6 between two, it is supplied using the external manifolds 8, 9, and 12 so that anode gas and cathode gas may intersect perpendicularly.
[0014] Next, actuation is explained. Since the generation-of-electrical-energy principle of a solid-state polyelectrolyte mold fuel cell layered product is described by the detail at JP,2-86071,A or JP,1-140562,A, reference is not made here. As solid-state polyelectrolyte film, the film of Nafion 117 of Dupont, Nafion 115, and Dow etc. is used. Anode gas and cathode gas are supplied to the single cel 6 using the gas division plate 7. Generally as anode gas, air is used as the reformed gas of a methanol, and cathode gas, and anode gas is humidified by a certain means. The exhaust gas of anode gas is supplied to the hydrogen-water recovery cel 4 from the gas division plate 5 of a recovery cel through the anode outlet side manifold 9. The pure hydrogen (gas which does not contain CO2) which contains moisture by passing an external current between the generation-of-electrical-energy collecting electrode plate 1 and the recovery cel collecting electrode plate 3 is generated. These gas is collected with the recovery hydrogen-water manifold 11, is supplied to the anode gas entrance-side manifold 8 through the hydrogen-water recovery gas outlet 16 and the hydrogen-water recovery gas inlet 17, and is reused as anode gas. Hydrogen and water are collected and the outlet gas of the hydrogen-water recovery cel 4 which almost became only carbon dioxide gas is discharged from the exhaust air gas manifold 10 as exhaust gas outside.
[0015] Drawing 2 is a ** type explanatory view explaining an operation of the hydrogen-water recovery cel 4. In drawing, 18 is the solid-state polyelectrolyte film, and it is thickness. It is 0.2mm or less. 19 and 20 are platinum catalyst layers, and the hydrogen in the exhaust gas 1 of an anode replaces a proton on platinum, reaches a counter electrode through an electrolyte membrane 18, and is again changed into hydrogen here. Since the oxidation reduction reaction of the hydrogen on platinum does not almost have **** in an overvoltage, the reaction of drawing 2 can be made to cause very efficiently. It is known that a child's water will move together several minutes to one proton, and the several times as many water molecules as this can be collected with a proton. Therefore, the collected gas 24 serves as pure hydrogen containing moisture (a steam or liquid), and serves as a presentation for which it was most suitable as anode gas excluding carbon dioxide gas. On the other hand, as for the exhaust gas 22 of a recovery cel, most serves as carbon dioxide gas. In addition, the amount of the hydrogen and water to collect is controllable with the electrical potential difference of an external current.
[0016] In this invention, by passing a current in the hydrogen-water recovery cel 4, the pure hydrogen which collects hydrogen and water from anode exhaust and contains moisture is generated, this is reused as anode gas, the humidification initial complement by the side of an anode becomes less, and a fuel can be used efficiently. Moreover, the amount of hydrogen discharged to the exterior decreases, the danger of exhaust air decreases, and safety improves.
[0017] example 2. -- in other examples of this invention, while short-circuiting between the generation-of-electrical-energy collecting electrode plates 1 and the recovery cel collecting electrode plates 3 which are shown in drawing 1 , the auxiliary fuel cell is inserted between both the collecting electrode plates 1 and 3. And supply of the power to the hydrogen-water recovery cel 4 is provided by this auxiliary fuel cell. Since an electrical potential difference required for per hydrogen-water recovery cel 1 cel is about 0.1-0.2V, power is fully provided with the auxiliary fuel cell of one cel to the number cel of hydrogen-water recovery cels. In addition, the external manifolds 8, 9, and 12 are arranged in this case at the form containing the generation-of-electrical-energy collecting electrode plate 1 and an auxiliary fuel cell. An auxiliary fuel cell may be the

same specification as the single cel 6.
[0018] In example 3. and the example of further others of this invention, the hole which penetrates the generation-of-electrical-energy collecting electrode plate 1, the hydrogen-water recovery cel 4, and the gas division plate 5 constitutes supply in the hydrogen-water recovery cel of anode exhaust gas, and piping from a hydrogen-water recovery cel to an anode entry side. Therefore, an external manifold becomes unnecessary and structure is simplified. The approach of supplying reactant gas using the hole which penetrates a cel and a gas division plate is described by the detail at JP,2-86071,A, and can be constituted easily.
[0019] In addition, in a solid-state polyelectrolyte mold fuel cell, it is common rather to pipe reactant gas etc. using such a hole. In this example, make a collecting electrode plate 1, the hydrogen-water recovery cel 4, and the gas division plate 5 penetrate, and the hole of the anode gas outlet side of the gas division plate 7 of the single cel 6 is supplied to the catalyst bed 19 of each hydrogen-water recovery cel. By making a collecting electrode plate 1, the hydrogen-water recovery cel 4, and the gas division plate 5 penetrate in another hole, and tying the pure hydrogen containing the moisture generated from the catalyst bed 20 of another side of a hydrogen-water recovery cel to the hole by the side of an anode gas entry The easily same function as piping by the external manifold of drawing 1 can be constituted. However, also when it is [structure] easier to use an external manifold when cel area is large, it thinks.
[0020]
[Effect of the Invention] As mentioned above, while forming a recovery cel collecting electrode plate in the outside of one [at least] generation-of-electrical-energy collecting electrode plate of a solid-state polyelectrolyte mold fuel cell layered product according to the hydrogen-water recovery device of the fuel cell layered product of this invention Between the above-mentioned generation-of-electrical-energy collecting electrode plate and recovery cel collecting electrode plates Through a gas division plate, carry out the at least one or more cel laminating of the hydrogen-water recovery cel which consists of solid-state polyelectrolyte film which has a platinum catalyst to both sides, and it is arranged in them. Since the exhaust gas of an anode was led to the above-mentioned hydrogen-water recovery cel, and a current is passed, the hydrogen and water in the exhaust gas of the above-mentioned anode are collected and it was made to return to the entrance side of the above-mentioned anode between the above-mentioned generation-of-electrical-energy collecting electrode plate and a recovery cel collecting electrode plate A fuel can be used efficiently, and the humidification initial complement of anode gas can be reduced, and the amount of hydrogen in exhaust gas can be reduced, and safety improves.
[0021] Moreover, by inserting an auxiliary fuel cell, it cannot be based on an external current, but the power of a hydrogen-water recovery cel can be provided with self generating, and recovery of hydrogen and water can be performed.
[0022] Furthermore, since the hole which penetrates a generation-of-electrical-energy collecting electrode plate, the above-mentioned hydrogen-water recovery cel, and a gas division plate constitutes the passage which supplies the exhaust gas of an anode to a hydrogen-water recovery cel, and supplies the hydrogen collected in the above-mentioned hydrogen-water recovery cel, and water to the entrance side of the above-mentioned anode, an external manifold becomes unnecessary and structure can be simplified.

[Translation done.]